Electronic Supplementary Material (ESI) for Soft Matter.

Supporting information

To

Time matters for macroscopic membranes formed by alginate and cationic β-sheet peptides

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The membranes notation

For the sake of brevity, these different membrane systems are described using **X**p**Y**d**Z**M notation (Table S1); where X = **F** or **A** denoting fresh or the 4 days aged PFK solution, respectively, Y is either 1 or 6 standing for the membrane ageing time in days, and Z assigns **S** or **P** for the membrane type (SMs and PMs respectively).

Table S1 - The abbreviated names of the membranes used in this study

Peptide age [days]	Membrane age [days]	Membrane shape	Membrane name
1	1	Planar	Fp1dPM
4	1	Planar	Ap1dPM
1	1	Spherical	Fp1dSM
4	1	Spherical	Ap1dSM
1	6	Planar	Fp6dPM
4	6	Planar	Ap6dPM
1	6	Spherical	Fp6dSM
4	6	Spherical	Ap6dSM

The osmotic pressure of the peptide solution surrounding the sac and membrane over time:

The osmolality of the solutions was measured using an osmometer (Osmomat 030, Gonotec). This apparatus determines the total osmolality of an aqueous solution by measuring its freezing point compared to a calibration solution.

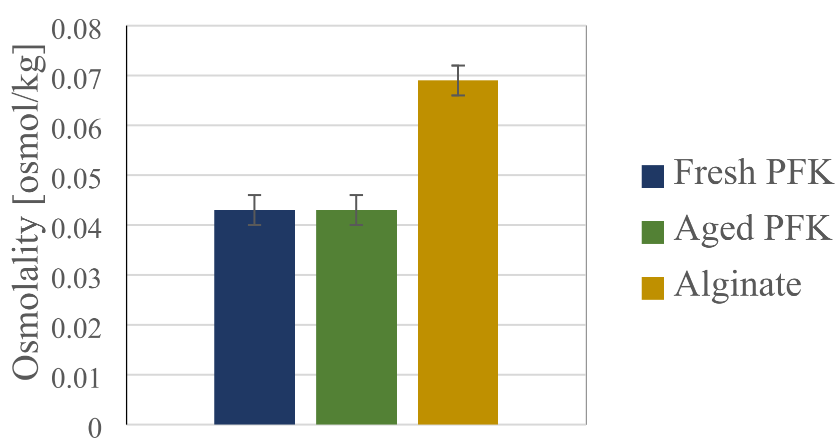

Figure S1 - The osmotic pressure of the PFK solution surrounding the membranes

The zeta potential of fresh and aged peptide solutions and the alginate solution:

Zeta potential of the peptide and the alginate were determined using Zetasizer Nano ZS (Malvern Instruments Ltd., Malvern, UK), by measuring 0.1wt% solutions.

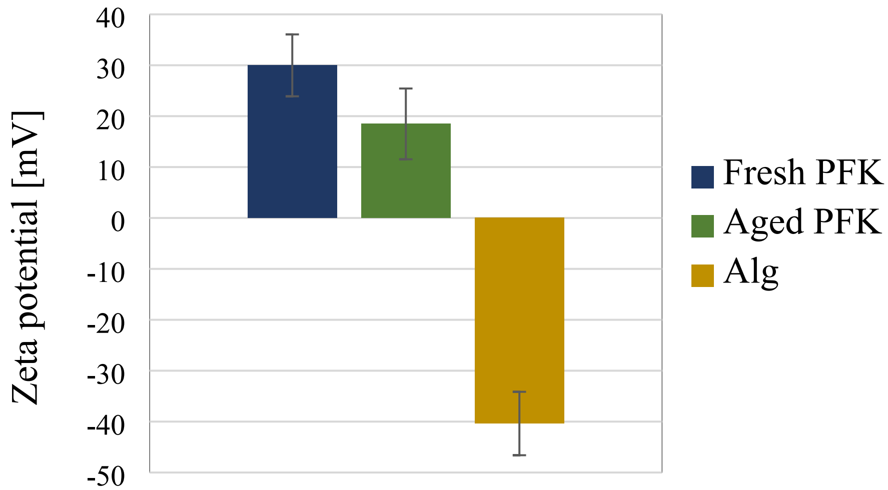

Figure S2 - The Zeta potential of 0.1wt% PFK and alginate solutions

The diffusion coefficient of fresh and aged PFK solutions.

The diffusion coefficients were determined by performing a DLS experiment using Zetasizer Nano ZS (Malvern Instruments Ltd., Malvern, UK). The D was extracted using the instrument's software.

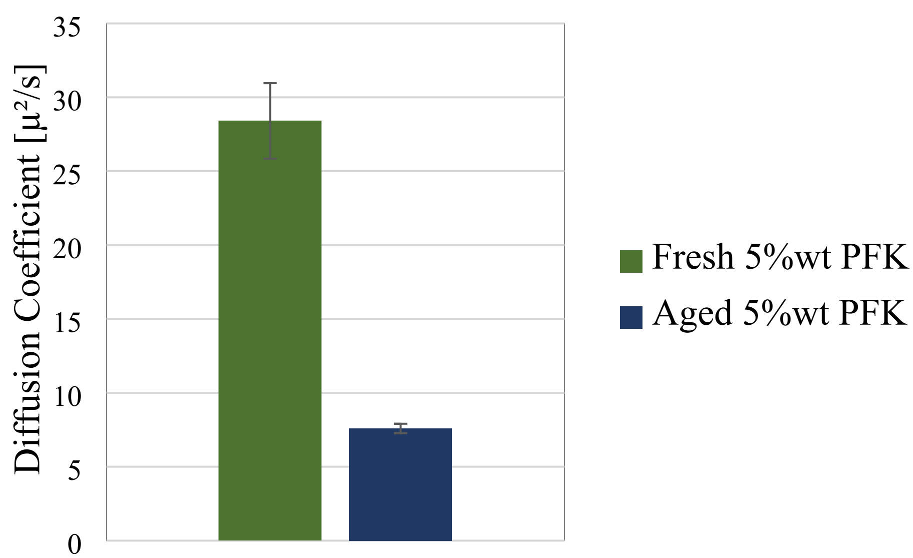

Figure S3 - The diffusion coefficient of the aged and fresh PFK solutions

Surface to volume ratio in spherical and planar membranes:

Spherical membranes:

The SMs volume is determined by the volume of the Alginate drop

$V_{SM} = 30\mu l = 30 \cdot 10^{-3} cm^3$

$= \frac{4\pi r^3}{3} \Rightarrow r = 0.193cm$

$S_{SM} = 4\pi r^2 = 0.467cm^2$

$S/V_{Sac} = 15.6cm^{-1}$

In order to be consistent the volume of the PMs was defined as well by the volume of the alginate

Planar membranes:

$V_{PM} = 100\mu l = 100 \cdot 10^{-3} cm^3$

$S_{PM} = \pi r^2 \cong \pi 0.4^2 cm^2 = 0.5cm^2$

$S/V_{PM} = 5cm^{-1}$

Diffusion length of the membranes

Spherical membrane:

Diffusion length is the radius of the spherical membrane, therefore:

$r = 0.193$cm≅0.2 cm

Planar membrane:

Diffusion length is the thickness of the membrane, therefore:

$S/V_{PM} = \frac{\pi r^2}{\pi r^2 h} = \frac{1}{h} = 5cm^{-1} \Rightarrow h = 0.2cm$

The effect of curvature on the the alignment of the perpendicular fibers

Figure S4 - a schematic representation of the effect of the membrane curvature on the alignment of the perpendicular fibers

The stability of the membranes in acetate and carbonate buffer solution

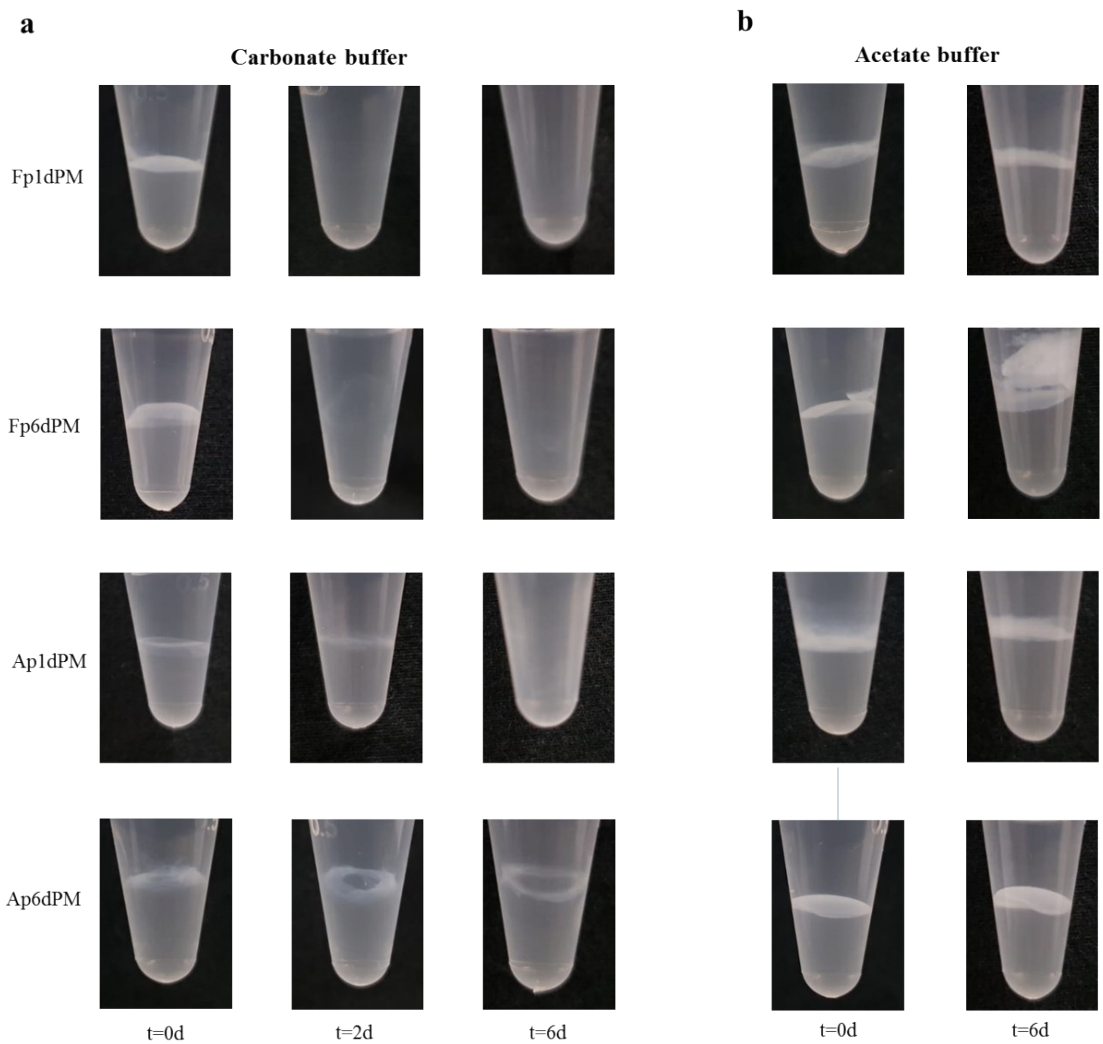

Figure S5 - images of the 4 types of membranes in carbonate buffer (a) and acetate buffer (b) over time.

Initial mass of PFK in the membranes

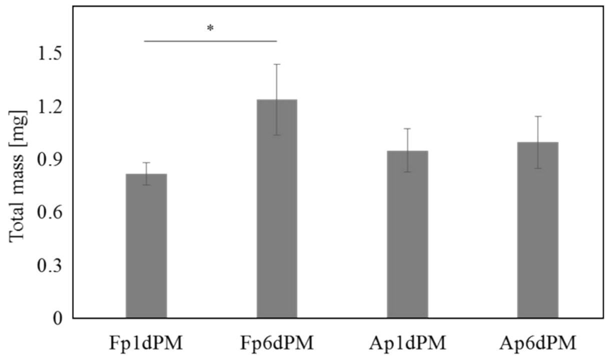

Figure S6 –initial mass of the PFK in the 4 types of membranes in PBS solution.